

# PHASE 2 VESSEL POPULATION AND PUMPOUT FACILITY ESTIMATES

## PUGET SOUND NO DISCHARGE ZONE FOR VESSEL SEWAGE



Prepared for  
Washington State Department of Ecology

Prepared by  
Herrera Environmental Consultants, Inc.



**Note:**

Some pages in this document have been purposely skipped or blank pages inserted so that this document will copy correctly when duplexed.

# PHASE 2 VESSEL POPULATION AND PUMPOUT FACILITY ESTIMATES

## PUGET SOUND NO DISCHARGE ZONE FOR VESSEL SEWAGE

Prepared for  
Washington State Department of Ecology  
3190 160th Avenue Southeast  
Bellevue, Washington 98008

Prepared by  
Herrera Environmental Consultants, Inc.  
1220 4th Avenue  
Olympia, Washington 98506  
Telephone: 360/754-7644

June 11, 2013



# CONTENTS

Introduction.....	1
Vessel Populations .....	3
Recreational Vessels .....	3
Liveaboard Vessels .....	9
Commercial Vessels .....	10
Puget Sound Pumpout Facilities .....	15
References .....	21

## Appendix A    Attributes of Puget Sound Pumpout Facilities

# TABLES

Table 1. Vessel Registrations by Vessel Length and County in 2011. ....	4
Table 2. Moorage Slip Counts by County and Action Area. ....	6
Table 3. Summary of Liveaboard Populations at Selected Marinas <sup>1</sup> .....	10
Table 4. Oceangoing Vessel Entries into Puget Sound for 2005. ....	11
Table 5. Puget Sound Harbor Vessel Population for 2005.....	11
Table 6. Vessel Traffic Density (number of signals/mile <sup>2</sup> /day) by Vessel Type and Action Area in 2005 for the VTRA Model.....	12
Table 7. Mobile Pumpout Services in Puget Sound.....	16

# FIGURES

Figure 1. Puget Sound Vessel Registrations by County and Vessel Length. ....	4
Figure 2. Moorage Locations in Puget Sound. ....	7
Figure 3. Summary of All Commercial Vessel Traffic in Puget Sound.....	13
Figure 4. Selected Commercial Vessel Traffic In Puget Sound.....	13
Figure 5. Location of Marinas and Known Public Pumpout Facilities in Puget Sound. ....	17



# INTRODUCTION

The Washington Department of Ecology (Ecology), in coordination with other agencies and interested stakeholders has been exploring the possibility of petitioning the United States Environmental Protection Agency (US EPA) to establish a No Discharge Zone (NDZ) for vessel sewage in all or parts of Puget Sound. Under a NDZ designation, no sewage from any vessels, whether or not it is treated by a marine sanitation device (MSD), would be allowed to be discharged in any portion of the area designated as a NDZ.

The US EPA is authorized, under the Federal Clean Water Act (CWA), to institute a NDZ in waters that are threatened by the discharge of sewage waste from vessels. The authorization allows the US EPA to “completely prohibit the discharge from all vessels of any sewage, whether treated or not” (40 CFR 401.4[a]). There are three possible pathways to designating a NDZ under CWA Section 312, and each uses a different set of criteria to justify the designation. Ecology is in the process of evaluating whether some or all of Puget Sound should be designated as a NDZ under CWA 312(f)(3), which bases the designation on whether there are a sufficient number of pumpout facilities available to boaters, and the need for additional environmental protection and enhancement. The specific requirements of CWA 312 (f)(3), and required petition elements have been summarized in a previous report (Herrera 2012a).

During 2012, the first phase of the process of gathering existing data to fulfill the petition requirements began. During that process, three reports were prepared to help clarify the NDZ petition process and fulfill specific elements of an NDZ petition. The first report summarized NDZ petition requirements and petition development strategies used by other states (Herrera 2012a). The second report summarized the environmental condition of Puget Sound and outlined the regulatory context for vessel sewage discharges (Herrera 2012b). The third report provided an initial characterization of Puget Sound’s vessel population and existing vessel sewage pumpout facilities (Herrera 2012c).

While much of the necessary supporting data for an NDZ petition was gathered during the first phase, a few data gaps were identified where more complete data would better fulfill the required elements of a NDZ petition. The purpose of this report is to summarize the findings of these data gathering efforts. Some of the data gaps identified included:

- Improved or refined estimates of recreational vessel populations
- An assessment of liveaboard boat populations
- Improved understanding of commercial vessel traffic
- Verification of pumpout facilities
- Evaluation of pumpout facility locations in relation to boating populations





# VESSEL POPULATIONS

Improving access to safe, reliable, and convenient pumpout facilities starts with learning more about the vessel population that uses Puget Sound. One of the primary goals of this study was to learn more about the types (size and purpose), mooring locations, and the operating areas of vessels in Puget Sound to help assess the adequacy of the existing network of pumpout facilities and services. Puget Sound has a large and active recreational boating population as well as a large volume of commercial vessel traffic. Additionally, there are a number of Puget Sound boaters who live on their boats year round (liveaboards). Each of these groups has different needs and constraints related to how sewage can best be managed.

The section below provides an estimate of the number of recreational and commercial vessels operated in Puget Sound, including an estimate of the number of recreational vessels that might be used as liveaboard vessels. Spatial patterns of commercial vessel operations and the locations of recreational vessel moorages are also discussed.

## Recreational Vessels

The first step to evaluating adequacy of pumpout facilities in Puget Sound is estimating the number and locations of recreational boats needing access to pumpout facilities. This information can be compared to pumpout facility information to assess whether there are enough pumpout facilities in the needed locations.

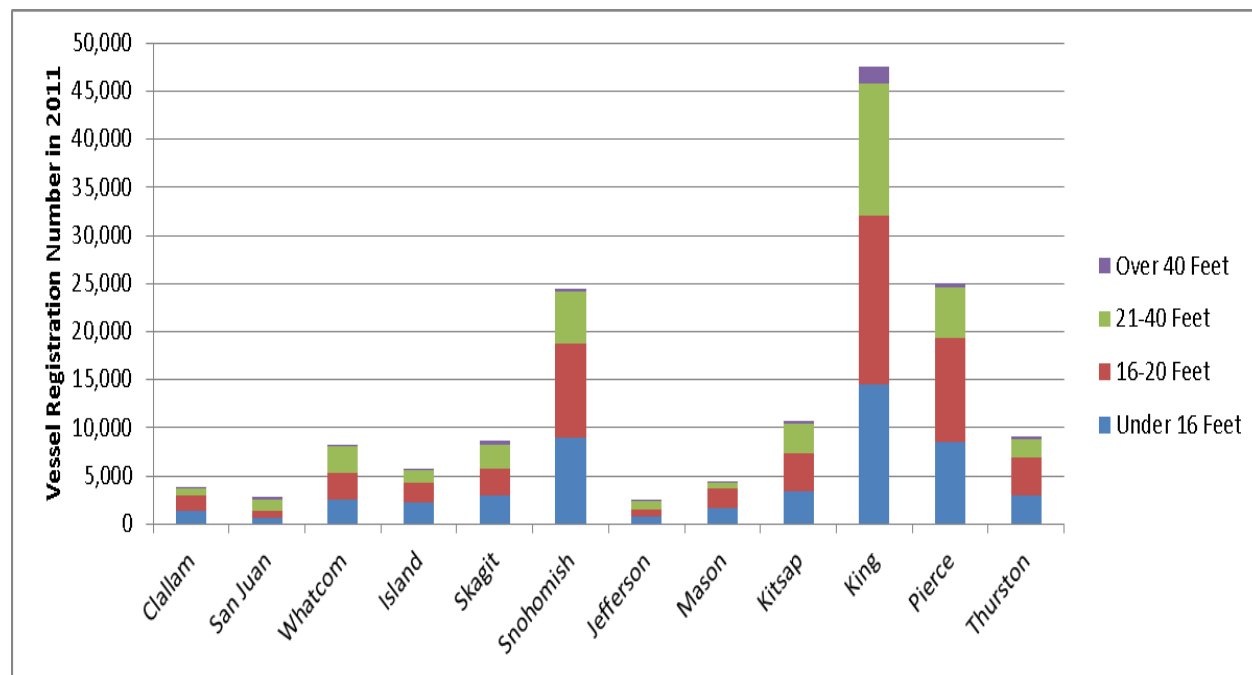
During the first phase of the NDZ data-gathering project, an estimate of recreational vessels was developed based on vessel registration data (Herrera 2012c). The same estimate (including error corrections) is included in this document and summarized in Table 1. In this second phase, an alternate method of estimating the Puget Sound recreational vessel populations was also used; under this alternate method an estimate was provided that was based on counts of marina slips and moorages. The marina slip count also provides a better assessment of where many boats may be located.

Table 1 and Figure 1 provide a summary of the vessel registration data from 2011 as obtained from the Washington State Department of Licensing (DOL). The data lists the number of boats registered in each county by size class. In 2011, there were 153,103 vessels registered in the counties adjacent to Puget Sound. This number includes recreational vessels as well as some commercial vessels registered in Washington State. As described in the Phase 1 report (Herrera 2012c), this data set is not a perfect measure of boats using Puget Sound. For example, not every vessel registered in a county adjacent to Puget Sound is moored or operated in the same county, or even in Puget Sound and many boats may be exclusively used on lakes and rivers. Conversely, a vessel which is moored and operated in Puget Sound may be registered somewhere far away. However, it is believed that the number of registered vessels listed by county in Table 1 represents a reasonable approximation of the number of vessels moored in that county's portion of Puget Sound, and that, if anything, it provides a conservative (high) estimate of the potential recreational vessel population.

**Table 1. Vessel Registrations by Vessel Length and County in 2011.**

Action Area	County	Vessel Length				Total Registered
		Under 16 Feet	16-20 Feet	21-40 Feet	Over 40 Feet	
Strait of Juan de Fuca	Clallam	1,414	1,565	771	64	3,814
San Juan/Whatcom	San Juan	696	601	1,303	229	2,829
San Juan/Whatcom	Whatcom	2,501	2,850	2,669	259	8,279
Whidbey Basin	Island	2,254	2,104	1,180	75	5,613
Whidbey Basin	Skagit	2,920	2,844	2,517	458	8,739
Whidbey Basin	Snohomish	9,013	9,748	5,469	253	24,483
Hood Canal	Jefferson	809	731	891	104	2,535
Hood Canal/South Puget Sound	Mason	1,693	1,975	679	44	4,391
North Central Puget Sound	Kitsap	3,372	4,012	2,978	377	10,739
South Central Puget Sound	King	14,508	17,520	13,754	1,742	47,524
South Puget Sound	Pierce	8,457	10,884	5,283	477	25,101
South Puget Sound	Thurston	2,986	3,969	1,938	163	9,056
Total Puget Sound	Total	50,623	58,803	39,432	4,245	153,103

Note: Data compiled from Washington Department of Licensing on January 6, 2012 for calendar year 2011 with 2012 expiration date, and excluding all non-registered vessels.

**Figure 1. Puget Sound Vessel Registrations by County and Vessel Length.**

Not all of the registered vessels would require access to pumpout facilities. Smaller boats, such as day sailors or runabouts that are used for excursions of a few hours in length rather than for entire days, don't typically have any kind of toilet facility or marine sanitation device (MSD). If boats shorter than 21 feet in length are subtracted from the DOL database (i.e., counting only boats 21 feet in length and larger), there are a total of 43,677 registered vessels. This represents the maximum population of locally registered recreational vessels that might require access to pumpout facilities or services under NDZ regulations. The number is considered a maximum because it includes boats between 21 and 26 feet in length, many of which would not likely have MSDs. Also, a small number of the total registered vessels are commercial vessels, and are not part of the recreational vessel population. While many of the large commercial vessels (e.g., cargo ships) would not be in this list because they are registered in other states or countries, many of the smaller commercial boats (e.g., commercial fishing boats) would be included in this estimate.

Not surprisingly, there are more registered vessels in counties with larger populations, i.e., Snohomish, King, Pierce, and Thurston Counties. Similarly, there are more large vessels (those likely requiring access to pumpout facilities) in the more populated counties bordering Puget Sound. Although vessels may be registered in one county and moored or operated in another, there is likely a correlation between registration location and boat location. Therefore there is probably a greater need for pumpout stations in the more populated areas of Puget Sound than in the less populated areas.

Another method of estimating recreational vessel populations was conducted conducting a virtual 'fly over' of Puget Sound to estimate the number and location of moorages (slips and buoys) available to Puget Sound boaters. Marina slips (both vacant and occupied) as well as vessels moored at popular mooring areas (e.g., Sucia Island in the San Juan Islands) were counted based on what was visible using Google Earth imagery captured during summer 2011 and summer 2012. During the virtual fly over, any group of more than 15 moored vessels (signifying a mooring field) or marina slips were counted and recorded. This data was used to create a map showing the concentrations of moorages (Figure 2). Individual marinas were not singled out because the goal of this exercise was to determine the potential number of boats in a given geographic area, rather than a marina by marina assessment of boater population. Personal moorages (i.e., shoreside docks and personal mooring buoys) were not counted. It was assumed that most of the boats that are moored at personal moorages are less than 21 feet in length and therefore would not have toilet facilities.

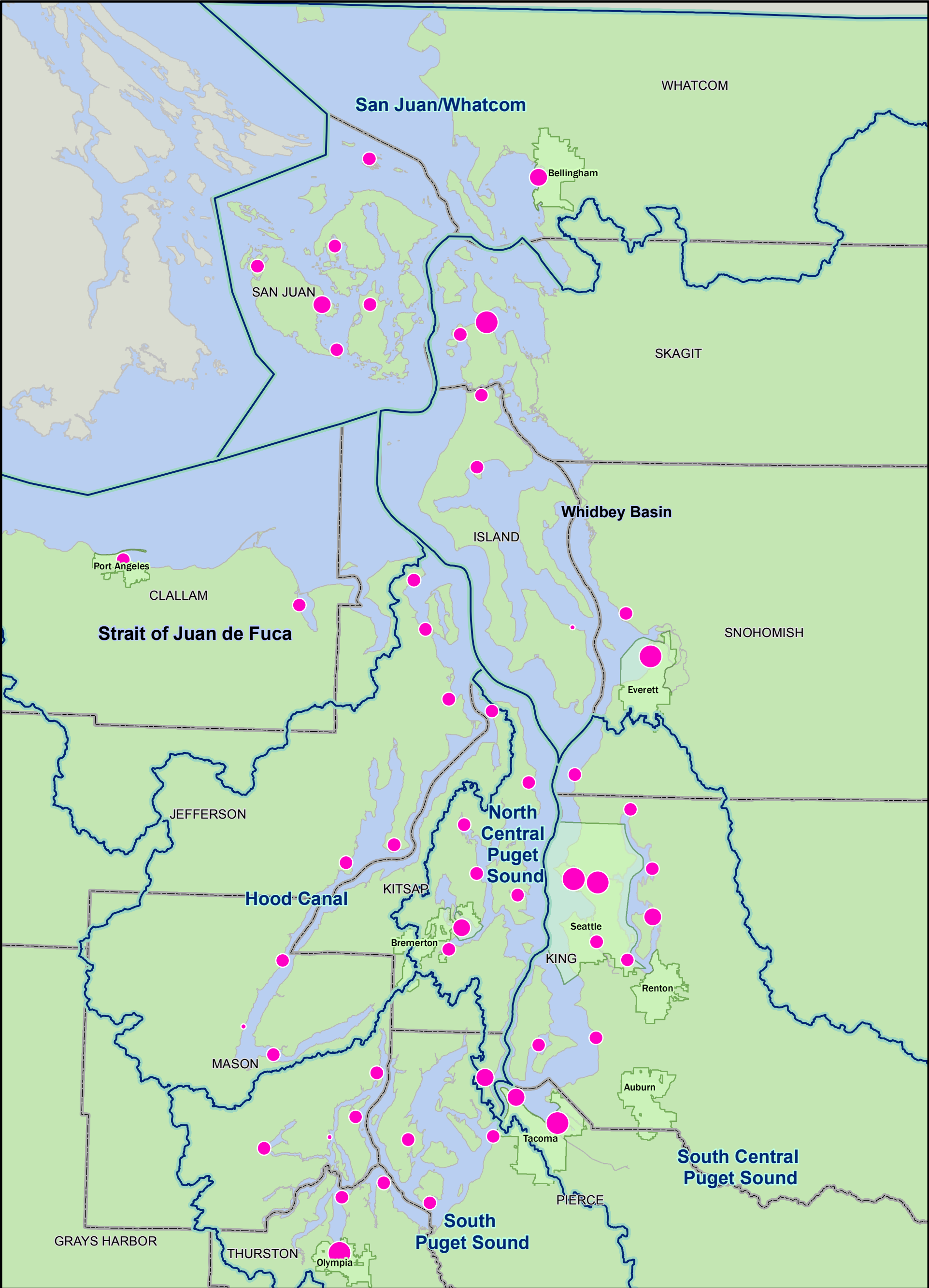
Vessel moorage capacity provides a valuable insight into where and how many boats there may be in Puget Sound. Larger vessels, particularly those with MSDs, are likely to be moored during the boating season. Smaller vessels are likely to be trailered; therefore using moorage capacity (i.e., the number of slips and buoys available for boats) ensures that fewer vessels without MSDs are included in the total vessel count. Slips used by commercial fishing boats and other smaller commercial vessels would have been included in the estimate, but it was estimated from the Phase 1 studies that this would account for only about 500 vessels.

There are approximately 23,555 moorages in Puget Sound based on the virtual flyover estimate (Figure 2). While this number is much smaller than the number of registered vessels over 21 feet (43,677), similar and more detailed spatial patterns were observed. For example, as

with registered vessels, there are much higher concentrations of moorages in more urban and populated areas (e.g., Seattle, Everett, and Tacoma). But, there are also a large number of moorages in popular boating destinations like the San Juan Islands, Anacortes, and Bellingham. The Strait of Juan de Fuca and the area around Whidbey Island have the lowest number of moorages compared with the rest of Puget Sound.

<b>Table 2. Moorage Slip Counts by County and Action Area.</b>							
<b>County</b>	<b>Action Area</b>						
	<b>Hood Canal</b>	<b>North Central Puget Sound</b>	<b>San Juan / Whatcom</b>	<b>South Central Puget Sound</b>	<b>South Puget Sound</b>	<b>Strait of Juan de Fuca</b>	<b>Whidbey Basin</b>
Clallam						550	
Island							275
Jefferson	850						
King				9,560			
Kitsap	75	2,100					
Mason	95			2,065	315		
Pierce		605			580		
San Juan			1,150				
Skagit							1,225
Snohomish				350			1,385
Thurston					1,750		
Whatcom			625				
<b>Total Slips by Action Area</b>	1,020	2,705	1,775	11,975	2,645	550	2,885
<b>Puget Sound Total</b>							<b>23,555</b>

The method used for estimating the number of moorages underestimates the total Puget Sound moorage capacity. Personal moorages were not counted, and neither were areas with less than 15 slips or moorages. There are many personal moorages and small marinas with less than 15 slips throughout Puget Sound, particularly in Hood Canal and Lake Washington, so this method could be underestimating the available moorages by a thousand moorages or more. It is generally accepted that smaller boats (those less likely to have toilet facilities beyond a porta-potty) are found at personal moorages, so ignoring this sector is not expected to contribute to a significant underestimate of the need for pumpout facilities. However, many of those vessels moored at smaller marinas, are likely to be large enough to contain an MSD and therefore would contribute to an underestimate of pumpout facility needs. More importantly, this exercise counted slips and buoys, not boats. Although some marinas may operate at full capacity during peak seasons, many do not. To meet the needs of a mobile boating population, there needs to be an excess of moorages to allow boaters to move freely between areas, so it can be assumed that there are fewer boats than the total number of moorages available. Therefore, this count of available slips and moorages is believed to also represent an overestimate of the boat population, albeit less of an overestimate than what was calculated based on registration information.



**Legend**

**Moorage Count**

- < 25
- 25 - 100
- 100 - 500
- 500 - 1000
- > 1000



Puget Sound Action Area boundary

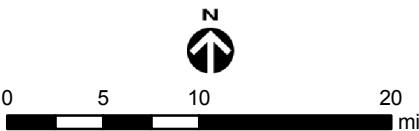


County boundary



City boundary

**Figure 2.**  
**Moorage Locations in Puget Sound.**



Coordinates: NAD83 Washington State Plane North (feet)

K:\Projects\Y2012\12-05362-000\Project\puget\_sound\_marinas.mxd (4/30/2013)



The number of vessels using Puget Sound will always be in flux, and is dependent on seasons, the local economy, and the regional population. The number of registered vessels over 21 feet (43,677) represents a maximum number of vessels that might require access to pumpout facilities. The estimated number of slips available to boaters (23,555), while just a proxy for the number of boats, may be a more accurate reflection of the actual number of recreational boats in Puget Sound that would require pumpouts. While neither method is perfect, the two estimation methods together provide a bracket between low and high reference points from which to evaluate the need for pumpout facilities.

## Liveaboard Vessels

Liveaboards are a subset of recreational boats that are occupied as a primary residence; they can range from small sailboats to giant yachts. During the Phase 1 data gathering effort, it became evident that little was known about the liveaboard vessel population in Puget Sound or how they manage their sewage, and whether establishment of an NDZ might pose additional impacts to liveaboard vessel owners and residents.

The primary concerns regarding sewage management on liveaboard vessels are that some of the boats might have limited mobility resulting in restricted access to shore based pumpout facilities. In addition, they would have higher sewage generation rates because the vessels may be occupied nearly 100 percent of the time, as compared with recreational vessels, which are only occasionally occupied.

To develop an estimate of the population of liveaboard vessels in Puget Sound, marinas that lease slip space to liveaboard vessels, liveaboard vessel associations, and sewage pumpout businesses that service liveaboard vessels were contacted. Forty marinas of varying size were contacted to learn about liveaboard vessels. There was little pattern in the number of liveaboard vessels based on the size or location of the marinas. In general, smaller marinas in less populated areas had fewer liveaboard vessels, and many of the smaller marinas do not allow liveaboard vessels.

Through conversations with liveaboard associations, ten marinas were identified that were believed to be the primary marinas that had significant liveaboard populations. Each of these marinas were contacted to obtain an estimate of their liveaboard population, and the results are listed in Table 3. The largest liveaboard population resides at the Shilshole Marina near Seattle, which has 300 liveaboard vessels, although there are also substantial populations in Everett and Olympia (Swantown). The total liveaboard population of this subset of marinas is 691. While this is an underestimate of the total number of liveaboards in Puget Sound because it does not include all marinas that have liveaboards, it likely represents the vast majority of the population.

Waste on liveaboard vessels is managed much the same way that it is on typical recreational vessels. It was previously thought that some liveaboard vessels might not be mobile and would have difficulty accessing pumpout facilities; however, this appears not to be the case. Contacts at the 10 marinas listed below stated that to be leased a liveaboard slip a vessel must be fully operational.



<b>Table 3. Summary of Liveaboard Populations at Selected Marinas<sup>1</sup>.</b>		
<b>Marina Name</b>	<b>Action Area</b>	<b>Number of Liveaboards</b>
Swantown Marina	South Puget Sound	70
Westbay Marina	South Puget Sound	35
Foss Harbor Marina	South Central Puget Sound	57
Oak Harbor Marina	North Central Puget Sound	30
Delin Docks	South Central Puget Sound	12
Ballard Mill	South Central Puget Sound	40
Shilshole Marina	South Central Puget Sound	300
Stimson Marina	South Central Puget Sound	25
Everett Marina	South Central Puget Sound	102
Friday Harbor Marina	San Juan / Whatcom	20
<b>Total</b>		<b>691</b>

Many marinas are also conscious of ensuring that liveaboards are appropriately pumping their waste. For example, liveaboard lease agreements at Swantown Marina and Westbay Marina in Olympia require a written contract between the vessel owners and a local mobile pumpout service, while Oak Harbor Marina has their own mobile pumpout service which is included with slip fees for all vessels, not just liveaboards. Several marinas also have each slip plumbed such that it is simple for marina staff or vessel owners to connect and pump out without moving their vessel.

This is not a complete list of marinas with liveaboards but includes those marinas identified by a liveaboard association as those with the most significant populations. The population numbers were based on phone calls made to the marinas during April 2013.

## Commercial Vessels

There are many different sizes and types of commercial vessels that frequent Puget Sound. They range from smaller vessels used for charter fishing, to huge freighters, tankers, and cruise ships. During Phase 1 of this study, the number of commercial vessels was estimated from a study conducted by the Puget Sound Maritime Air Forum (Starcrest 2007). According to that study, there were 2,937 entries of large ocean going vessels into Puget Sound in 2005 (Table 4). It was estimated that there are 678 other commercial vessels that operate mostly within Puget Sound (e.g., escort tugs), or have Puget Sound as their home port (e.g., the fleet of fishing vessels that travels to Alaska each year) (Table 5). Since the location of commercial vessels is more dynamic than that of recreational vessels, the question is less about the absolute number of commercial vessels in Puget Sound, and more about vessel traffic patterns such as how many, what kind, and where are vessels operating at a given time.

Most commercial vessels are required to send out an Automated Identification System (AIS) signal (US Department of Homeland Security 2013). The AIS signal announces a ship's identity, type, and position in real time. The data is used by the US Coast Guard for homeland security purposes, and is used by ship captains to help avoid collisions. Some larger recreational vessels



(such as yachts) may also use an AIS system, and therefore would be included in this dataset. AIS data for 2005 was collected and compiled by the George Washington University Engineering Management and Systems Engineering Department. This data set is a compilation of every transit by large vessels with AIS transponders. The data was combined and summarized to reveal traffic density for each vessel type by day, and for each Action Area, as shown in Table 6.

<b>Table 4. Oceangoing Vessel Entries into Puget Sound for 2005.</b>	
<b>Vessel Type</b>	<b>Number of Vessels</b>
Auto Carriers	188
Bulk Carriers	310
Container Ships	1,336
Cruise Ships	167
General Cargo	169
Oceangoing Tugs	146
Miscellaneous	16
Reefer	5
Roll on Roll Off	133
Tanker	467
<b>Total</b>	<b>2,937</b>

Note: Table 4 was adapted from Starcrest (2007)

<b>Table 5. Puget Sound Harbor Vessel Population for 2005.</b>	
<b>Harbor Craft Vessel Type</b>	<b>Number of Vessels</b>
Commercial Fishing	347
Ocean Tugboats	68
Harbor Tugboats	60
Excursion	60
Government	52
Ferry	45
Workboat	27
Assist and Escort Tugboats	19
<b>Total</b>	<b>678</b>

Note: Table 5 was excerpted from Starcrest (2007)

Traffic density, for the purpose of this report, is defined as the total number of signals (the number of vessels) received in 2005 divided by 365 (the number of days in the year), and divided again by the square mileage of the Action Area. The result of this calculation gives an average number of vessels that passed through each square mile of an Action Area on a given day. Data from the table can be interpreted in many ways. The table can be used to determine which type of commercial vessels have the highest average density in Puget Sound (i.e., fishing vessels); which Action Area has the greatest density of commercial vessels (i.e., South Central Puget Sound); and for individual Action Areas, which commercial vessels are dominant (for

example in South Puget Sound, the tug-barge category has the greatest density, while in North Central Puget Sound, it is ferry traffic).

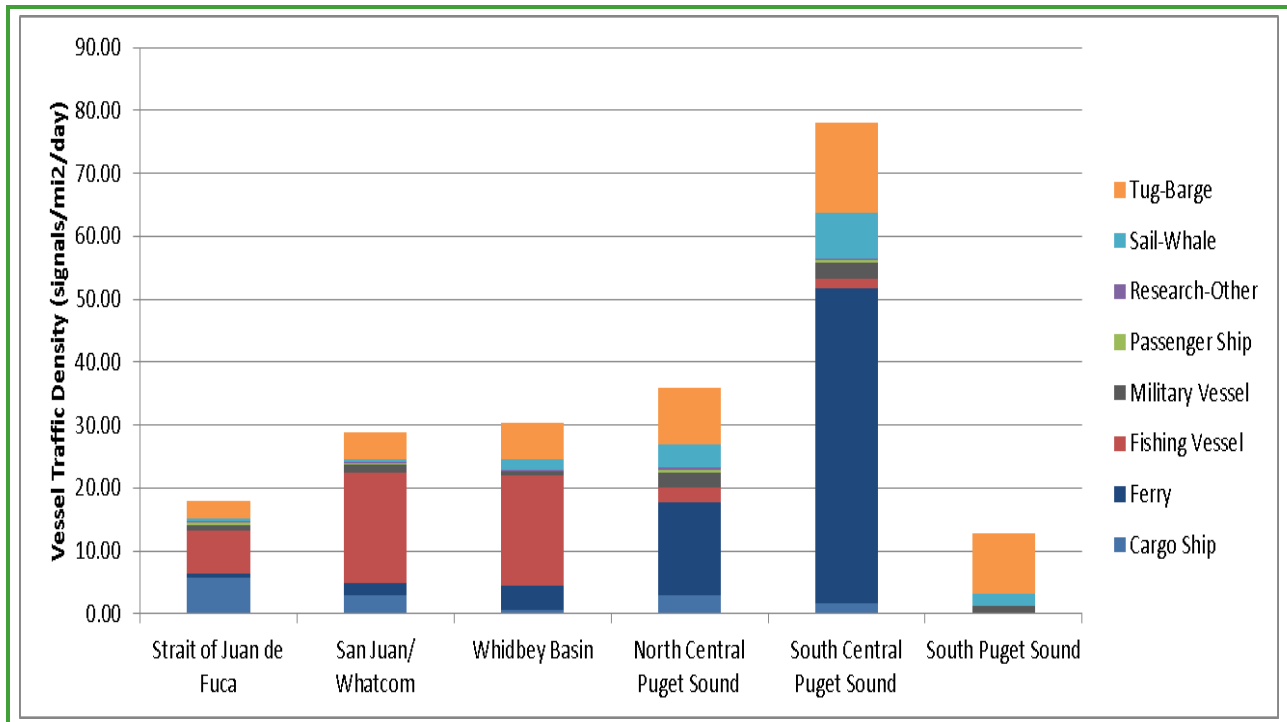
**Table 6. Vessel Traffic Density (number of signals/mile<sup>2</sup>/day) by Vessel Type and Action Area in 2005 for the VTRA Model.**

Action Area	Cargo Ship	Ferry	Fishing Vessel	Military Vessel	Passenger Ship	Research-Other	Sail-Whale	Tug-Barge	Total
Strait of Juan de Fuca	5.82	0.65	6.81	0.86	0.34	0.23	0.49	2.69	17.89
San Juan/Whatcom	2.89	1.98	17.62	1.19	0.35	0.04	0.50	4.31	28.88
Whidbey Basin	0.74	3.70	17.59	0.65	0.08	0.10	1.71	5.87	30.43
North Central Puget Sound	3.09	14.71	2.37	2.28	0.40	0.38	3.65	8.98	35.85
South Central Puget Sound	1.73	50.02	1.60	2.54	0.39	0.20	7.15	14.42	78.04
South Puget Sound	0.03	0.00	0.00	1.26	0.00	0.00	1.88	9.60	12.78
Hood Canal	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Puget Sound	3.90	5.35	9.91	1.18	0.32	0.17	1.30	4.87	26.99

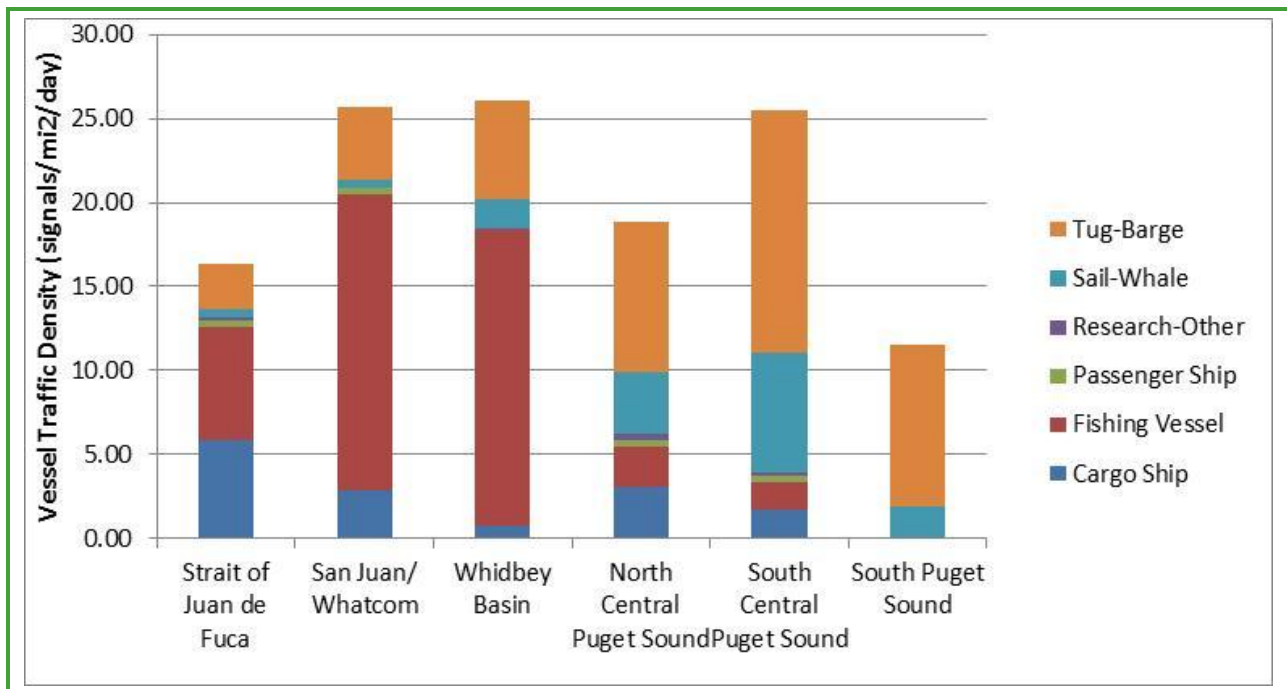
Data provided by J. Rene van Dorp and Jason R.W. Merrick on March 29, 2013, George Washington University.  
NA = Data Not Available

The South Central Puget Sound Action Area experiences the most commercial vessel traffic for almost all vessel categories (Table 5, Figure 3). The majority of the traffic is ferry vessels, but there is also a substantial amount of tugboat and ‘sail whale’ traffic (yachts and whale watching boats), followed by the other vessel categories. Cargo ship and fishing vessel traffic is highest along transit routes (such as the Strait of Juan de Fuca), and where there are major ports and refineries.

It was learned during the first phase of this project that Washington State Department of Transportation Ferries and US military vessels use their own pumpout facilities. Therefore, for the purpose of this analysis, these vessel categories can be ignored as their need for access to pumpout facilities is already met, and would not be affected by the institution of a NDZ. When ferries and military vessels are ignored (Figure 4) patterns in traffic among the other vessel categories become more apparent. Fishing vessels are the dominant vessel traffic category in the San Juan/Whatcom, Whidbey Basin and the Strait of Juan de Fuca Action Areas. Tugs and barges are the dominant vessel traffic category in North and South Central Puget Sound, and the South Puget Sound Action Areas, although tug and barge traffic is moderately high in all of the Action Areas. Sail-Whale activity is largely limited to the more urban action areas.



**Figure 3. Summary of All Commercial Vessel Traffic in Puget Sound.**



**Figure 4. Selected Commercial Vessel Traffic In Puget Sound.**



## PUGET SOUND PUMPOUT FACILITIES

The majority of pumpout facilities for recreational vessels and a few pumpout options for large commercial vessels were identified in the Phase 1 data gathering effort (Herrera 2012c). Since then, the list of recreational pumpout facilities has been refined, and possible improvements to Puget Sound's pumpout facility network are materializing.

There were 106 land-based publically accessible pumpout facilities identified during Phase 1 of the data gathering effort (Herrera 2012c), and nine mobile pumpout services. However, a number of these facilities were listed as unverified because it could not be confirmed that the pumpouts were still operational. During this second phase of the study, additional attempts were made to contact the unverified facilities, and those marinas that still could not be reached were removed from the list. The refined list (provided in Appendix A) includes 100 land-based pumpout facilities, all of which are shown on Figure 5.

Mobile pumpout vessels offer Puget Sound boaters opportunities to pumpout their holding tanks without visiting a shoreside facility. There are nine companies in Puget Sound operating a total of 12 boats which perform pumpout services for boaters. The owners of six companies (indicated in bold on Table 7) were interviewed to verify the service areas of each company, and to gather details of the company's operations such as the maximum size vessel they can pump out, and where they ultimately discharge the pumped sewage. The results from these interviews are summarized in Table 7 and the following paragraphs.

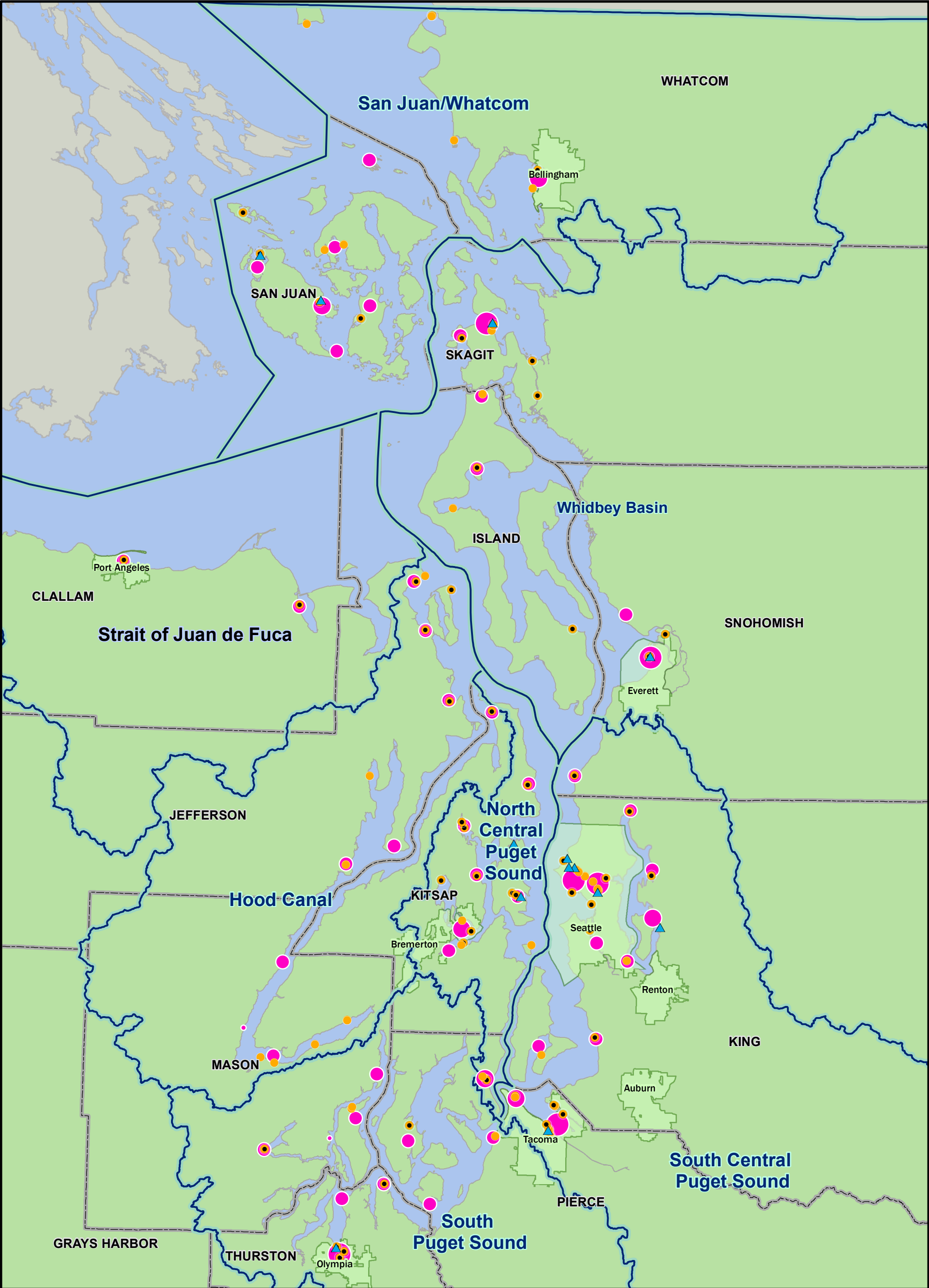
The pumpout vessels in Puget Sound operate primarily in densely populated areas. The majority of vessel home marinas are in the Seattle area (Figure 5). However, there are mobile pumpout services in Olympia, Tacoma, and Anacortes, as well as seasonally operating services in Roche Harbor and other San Juan Island locations. The service areas for each service listed in Table 7 are the advertised service areas. According to the pumpout company owners' the actual areas in which they typically operate are smaller. There needs to be sufficient demand for their services to justify time and fuel costs as they move further from the boats' point of origin. All of the mobile pumpout service owners contacted indicated that they have the capacity for additional clients should it be needed.

A preliminary inventory of Puget Sound pumpout facilities (Herrera 2012) indicated that there may be a paucity of shoreside pumpout facilities available to large commercial vessels (i.e., fishing vessels, freighters, tugs, and barges) that operate in Puget Sound. All of the contacted mobile pumpout operators indicated that they could pump any size vessel, and frequently contract with large vessels. However, since the mobile pumpout service boats have limited capacity pumping out a large vessel can require multiple trips. Another issue that was raised by commercial vessel groups is that the pumpout boats may not have the proper fittings to connect to a large vessel's holding tank.

Pumpout facilities and mobile services appear to be conveniently located for most Puget Sound Boaters. Land based pumpout facilities and mobile pumpouts are shown together with the

**Table 7. Mobile Pumpout Services in Puget Sound.**

<b>Company</b>	<b>Service Areas</b>	<b>Number of Boats</b>	<b>Price</b>	<b>Primary Type of Vessels Serviced</b>	<b>Capacity to Serve Large Vessels</b>	<b>Where Is Pumped Sewage Disposed?</b>
Terry and Sons	Seattle Area	1	\$30-45 (more if out of area or not on schedule)	All vessels	Yes	Public pumpouts
Rose Head Service	Port Everett Only	1	\$15-23	All vessels	Yes	Public pumpout
SS Head	Seattle Area	2	\$20 and up	95% liveaboard	Yes	Seattle wastewater system
Seattle Sanitation Service	Seattle Area	1	\$25	Primarily liveaboards	Yes	Seattle wastewater system
Pelican Pump	Olympia Area	1	~\$24 (more for big tanks)	Primarily liveaboards	Yes	Swantown Pumpout
Pump Me Out	Seattle Area, Tacoma Area, Anacortes and San Juan Islands	3	\$25-35	Liveaboards and other vessels	Yes	Generally public pumpouts
Sweet Pea Pumping Service	Liberty Bay and Port Madison	2	\$20-30 (more for big tanks)	Unknown	110 gallon capacity	Poulsbo wastewater system
Phecal Phreak	Roche Harbor Marina	1	Free as part of moorage fee	All vessels	Yes	Public pumpout
Pumpty Dumpty	Port of Friday Harbor and nearby Marinas	1	\$5-32 (more for big tanks)	All	150 gallon capacity	Friday Harbor wastewater system



**Legend**

**Moorage Count**

- < 25
- 25 - 100
- 100 - 500
- 500 - 1000
- > 1000



Mobile pumpout<sup>2</sup>



Pumpout only



Pumpout with dump station



County boundary



City boundary

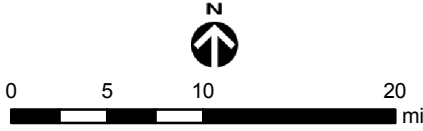


Puget Sound Action Area boundary

**Notes:**

1. Pumpout facility information is continually changing. For up-to-date information, the Washington State Parks pumpout database should be accessed.
2. Mobile pumpout locations indicate the home marina for the pumpout vessels. The area serviced by each vessel, and maximum distance traveled varies by company and the demand for their services.

**Figure 5.**  
**Estimates of Moorage Numbers**  
**and Locations and Public Pumpout**  
**Facilities in Puget Sound.<sup>1</sup>**



Coordinates: NAD83 Washington State Plane North (feet)

K:\Projects\Y2012\12-05362-000\Project\marinas\_pumpouts.mxd (6/17/2013)





moorage location (Figure 5). As would be expected, more pumpout facilities are available where there are more boats. The areas where coverage is less dense are around Whidbey Island, and the Strait of Juan de Fuca; however, there are also fewer moorages in these areas. It was also noted in a recreational boater survey (Herrera 2013) that many boaters feel that additional pumpout facilities would be helpful in the San Juan Islands. Although this is not necessarily evident by the information displayed in Figure 5, it may reflect the higher peak period demand in this area.

Based on Clean Vessel Act (CVA) guidelines, the Puget Sound area overall has plenty of pumpout facilities to serve the recreational vessel population. The CVA guidelines suggest that there should be a ratio of between 300 to 600 boats per pumpout during the period of peak occupancy. The definition of occupancy rate and a detailed procedure on completing the CVA calculations is described in the CVA guidelines (CVA 1994). Based on vessel registration data there are a maximum of 43,667 boats in Puget Sound that would require access to pumpout facilities. At the 40 percent peak occupancy rate recommended by the CVA guidelines, 17,467 of the 43,667 boats would require access to a pumpout facility during peak boating season. Under this scenario, there would be a ratio of 177 boats for each pumpout facility, not including the mobile services. Using the lower and probably more reasonable boat population estimate of 23,555 obtained from the moorage count, and the same 40 percent occupancy rate (9,422 boats), there would be a ratio of 96 boats per pumpout, not including the mobile services. By these calculations, the Puget Sound has at a minimum nearly two times to a maximum of more than six times more pumpout facilities than what is suggested in the CVA guidelines. While it is possible that the pumpout facilities are not ideally distributed and that there are some areas where additional pumpout facilities would be beneficial, the overall capacity comfortably exceeds the guidelines.



## REFERENCES

CVA. 1994. Clean Vessel Act Pump Station and Dump Station Technical Guidelines. Federal Register. Vol. 59. No. 47. March 10, 1994.

Herrera. 2012a. Puget Sound No Discharge Zone For Vessel Sewage: No Discharge Zone Petition Requirements and Petition Research. Ecology Publication Number 12-10-031. Prepared by Herrera Environmental Consultants, Inc., for Washington State Department of Ecology, Olympia, Washington. March 2012.

Herrera. 2012b. Puget Sound No Discharge Zone For Vessel Sewage: Puget Sound Condition, Sewage Discharge, and the Costs and Benefits of Establishing a NDZ. Ecology Publication Number 12-10-031. Prepared by Herrera Environmental Consultants, Inc., for Washington State Department of Ecology, Olympia, Washington. April 2012.

Herrera. 2012c. Puget Sound No Discharge Zone for Vessel Sewage: Puget Sound Vessel Population and Pumpout Facilities. Ecology Publication Number 12-10-031. Prepared by Herrera Environmental Consultants, Inc., for Washington State Department of Ecology, Olympia, Washington. May 2012.

Herrera. 2013. Puget Sound No Discharge Zone For Vessel Sewage: Recreational Boater Survey. Prepared by Herrera Environmental Consultants, Inc., for Washington State Department of Ecology, Olympia, Washington. May 2013.

Starcrest. 2007. Puget Sound Maritime Air Emissions Inventory. Prepared by Starcrest Consulting Group LLC. for Puget Sound Maritime Air Forum. April 2007.

US Department of Homeland Security. 2013. AIS Frequently Asked Questions. US Department of Homeland Security Website. <http://www.navcen.uscg.gov/?pageName=AISFAQ>. Site accessed April 27, 2013.



## **APPENDIX A**

---

# **Attributes of Puget Sound Pumpout Facilities**



Table A-1. Attributes of Puget Sound Pumpout Facilities (not including mobile services). <sup>a</sup>											
Facility Name	Location	Water Body	Latitude	Longitude	Type of Facility	Number of Stationary Pumpouts	Number of Portable Pumpouts	Number of Dump Stations	Hours of Operation <sup>b</sup>	Maximum Vessel Length	Minimum Depth at Low Tide
16th Street Moorage	Tacoma	Puget Sound	47°14'73"	122°26'00"	Public Marina	1	0	Unknown	8:00 am to 12:00 am	300	15
Alderbrook Inn	Union	Hood Canal	47°21'00"	123°04'05"	Other	3	0	0	By appointment	85	
Allyn Dock	Allyn	Puget Sound	47°25'09"	122°54'11"	Public Marina	1	Unknown	Unknown	24 hours a day		2
Arabella's Landing Marina	Gig Harbor	Puget Sound	47°20'03"	122°35'00"	Private Marina	1	0	Unknown	24 hours a day	150	8
Ballard Mill Marina	Seattle	Lake Washington	47°39'44"	122°22'58"	Other	1	Unknown	0	24 hours a day	50	
Blaine Harbor-Port of Bellingham	Blaine	Strait of Georgia	48°59'26"	122°45'56"	Public Marina	0	4	4	8:00 am to 5:00 pm		12
Blake Island State Park	Manchester	Puget Sound	47°32'37"	122°29'00"	Public Marina	1	Unknown	Unknown	24 hours a day		10
Boat Street Marina	Seattle	Lake Union	47°38'9"	122°18'8"	Public Marina	1	0	1	24 hours a day	40	
Breakwater Marina, Inc.	Tacoma	Puget Sound	47°18'27"	122°30'48"	Full Service Marina	0	1	1	7:00 am to 8:00 pm		15
Canal Marina	Seattle	Lake Union	47° 39' 9"	122°21'46"	Full Service Marina	1	0	0	Unknown	45	Unknown
Carillon Point Marina	Kirkland	Lake Washington	47°39'21"	122°12'34"	Private Marina	1	Unknown	1	24 hours a day	90	6
Chinook Landing Marina	Tacoma	Puget Sound	47°16'50"	122°24'09"	Private Marina	1	0	1	8:30 am to 5:00 pm	65	8
City of Bainbridge Island Eagle Harbor Waterfront Park	Bainbridge Island	Puget Sound	47°37'15"	122°31'10"	Public Marina	1	Unknown	1	24 hours a day	150	5
City of Des Moines Marina	Des Moines	Puget Sound	47°24'06"	122°19'58"	Public Marina	1	1	1	Unknown	75	-12
Crow's Nest Marina	Tacoma	Puget Sound	47°17'37"	122°25'14"	Private Marina	1	1	1	Variable	40	
Deception Pass State Park	Oak Harbor	Puget Sound	48°24'06"	122°37'30"	State Park Marina	1	Unknown	Unknown	24 hours a day		25
Deer Harbor Marina	Deer Harbor	Puget Sound	48°37'14"	123°0'17"	Full Service Marina	1	Unknown	Unknown	8:30 am to 4:30 pm	150	5
Delin Docks	Tacoma	Thea Foss Waterway	47°15'00"	122°25'48"	Private Marina	3	Unknown	1	8:00 am to 12:00 am	60	6
Dock Street Marina	Tacoma	Thea Foss Waterway	47°14'29"	122°26'00"	Public Marina	2	0	2	8:00 am to 12:00 am	130	6
Dock Street Marina 'C'	Tacoma	Thea Foss Waterway	47°14'29"	122°26'00"	Public Marina	2	0	2	8:00 am to 12:00 am	130	6
Dock Street Marina 'F'	Tacoma	Thea Foss Waterway	47°14'29"	122°26'00"	Public Marina	2	Unknown	2	8:00 am to 12:00 am	130	6
Dockton Park	Vashon	Puget Sound	47°22'22"	122°27'17"	Public Marina	1	Unknown	Unknown	Variable	60	20
Driftwood Keys Club	Hansville	Hood Canal	47°54'26"	122°35'11"	Private Marina	1	Unknown	1	24 hours a day	40	
Eagle Harbor Marina	Bainbridge	Puget Sound	47°37'03"	122°30'50"	Private Marina	0	1	0	Variable	60	6
Elliott Bay Marina	Seattle	Puget Sound	47°37'36"	122°23'31"	Private Marina	1	1	1	24 hours a day		30
Fairview Marina	Seattle	Lake Union	47°37'54"	122°19'51"	Private Marina	1	0	0	24 hours a day	44	0
Fishermen's Terminal - Port of Seattle	Seattle	Lake Union Ship Canal	47°39'33"	122°22'39"	Public Marina	1	Unknown	Unknown	7:00 am to 9:00 pm	100	
Fort Flagler	Nordland	Admiralty Inlet	48°05'44"	122°41'16"	State Park Marina	Unknown	Unknown	1	6:30 am to dusk		6
Foss Harbor Marina	Tacoma	Puget Sound	47°15'22"	122°26'01"	Private Marina	1	0	1	Variable	90	
Foss Landing Marina	Tacoma	Puget Sound	47°14'38"	122°25'55"	Private Marina	1	0	0	Unknown	75	5





Table A-1 (continued). Attributes of Puget Sound Pumpout Facilities (not including mobile services). <sup>a</sup>											
Facility Name	Location	Water Body	Latitude	Longitude	Type of Facility	Number of Stationary Pumpouts	Number of Portable Pumpouts	Number of Dump Stations	Hours of Operation <sup>b</sup>	Maximum Vessel Length	Minimum Depth at Low Tide
Gig Harbor	Gig Harbor	Puget Sound	47°20'07"	122°35'13"	Public Marina	1	Unknown	Unknown	24 hours a day		
H.C. Henry Pier	Seattle	Puget Sound	47°38'"	122°20'"	Private Marina	1	Unknown	Unknown	24 hours a day	60	
Harbor Island Marina - Port of Seattle	Seattle	Puget Sound	47°34'07"	122°20'57"	Public Marina	1	Unknown	1	24 hours a day		12
Harbour Marina	Bainbridge Island	Puget Sound	47°37'25"	122°31'37"	Private Marina	1	0	1	24 hours a day	60	15
Harbour Village Marina	Kenmore	Lake Washington	47°45'35"	122°15'77"	Private Marina	1	0	1	24 hours a day	50	6
Hood Canal Marina	Union	Hood Canal	47°21'54"	123°05'67"	Unknown	Unknown	Unknown	Unknown	Unknown		
Islands Marine Center	Lopez Island	Puget Sound	48°30'55"	122°54'56"	Public Marina	5	0	1	Variable	80	30
Jarrell Cove State Park	Shelton	Puget Sound	47°16'53"	122°53'16"	State Park Marina	1	0	0	24 hours a day		4
Jarrell's Cove Marina	Shelton	Puget Sound	47°17'03"	122°53'12"	Private Marina	1	Unknown	Unknown	10:00 am to 6:00 pm	100	5
Jeresich City Dock	Gig Harbor	Puget Sound	47°19'54"	122°34'46"	Other	1	0	1	24 hours a day	50	
John Wayne Marina	Sequim	Strait of Juan de Fuca	48°03'56"	123°02'23"	Public Marina	1	0	2	24 hours a day	100	12
La Conner Marina	La Conner	Puget Sound	48°24'04"	122°29'48"	Public Marina	3	0	2	24 hours a day	600	10
Liberty Bay Marina	Poulsbo	Puget Sound	47°43'27"	122°38'38"	Private Marina	1	1	1	8:00 am to 6:00 pm	80	6
Marine Service Center	Anacortes	Puget Sound	48°30'06"	122°36'02"	Full Service Marina	3	Unknown	Unknown	Variable	60	
Morrison's North Star Fuel Dock/Diamond Marina	Seattle	Lake Union	47°38'41"	122°20'38"	Other	2	Unknown	Unknown	Variable	200	
Murphy's Landing Marina	Gig Harbor	Puget Sound	47°20'13"	122°35'19"	Private Marina	1	Unknown	Unknown	Variable		
Narrows Marina	Tacoma	Puget Sound			Private Marina	0	Unknown	Unknown	Variable		
North Point Moorage Marina	Tacoma	Thea Foss Waterway	47°15'51"	122°26'24"	Public Marina	2	0	0	24 hours a day		25
Oak Harbor Marina	Oak Harbor	Puget Sound	48°17'12"	122°38'03"	Public Marina	2	2	2	8:00 am to 5:00 pm	75	12
Oakland Bay Marina	Shelton	Puget Sound	47°13'24"	123°06'18"	Public Marina	1	Unknown	Unknown	24 hours a day	50	20
Parkshore Marina	Seattle	Lake Washington	47°31'20"	122°15'40"	Private Marina	1	1	0	24 hours a day	50	3
Penrose Point State Park	Lakebay	Puget Sound	47°15'29"	122°45'15"	Public Marina	1	0	1	24 hours a day		3
Percival Landing Park	Olympia	Puget Sound	47°02'55"	122°54'19"	Public Marina	1	0	1	24 hours a day		8
Pleasant Harbor Marina	Brinnon	Hood Canal	47°39'70"	122°55'07"	Public Marina	1	1	0	8:00 am to 8:00 pm	150	4
Point Defiance Marina Complex	Tacoma	Puget Sound	47°18'22"	122°30'48"	Public Marina	1	0	Unknown	24 hours a day	60	16
Point Hudson Marina	Port Townsend	Admiralty Inlet	48°06'57"	122°44'58"	Full Service Marina	1	Unknown	Unknown	24 hours a day	100	8
Point Roberts Marina	Point Roberts	Strait of Georgia	48°58'21"	123°03'46"	Full Service Marina	2	Unknown	Unknown	24 hours a day	200	7
Port Angeles Boat Haven	Port Angeles	Strait of Juan de Fuca	48°07'38"	123°27'09"	Public Marina	2	Unknown	1	24 hours a day	50	15
Port Hadlock Marina	Port Hadlock	Admiralty Inlet	48°01'54"	122°44'43"	Private Marina	1	1	1	8:00 am to 5:00 pm	60	15
Port Ludlow Bay Marina	Port Ludlow	Hood Canal	47°55'17"	122°41'08"	Private Marina	1	1	1	24 hours a day	100	15



Table A-1 (continued). Attributes of Puget Sound Pumpout Facilities (not including mobile services). <sup>a</sup>											
Facility Name	Location	Water Body	Latitude	Longitude	Type of Facility	Number of Stationary Pumpouts	Number of Portable Pumpouts	Number of Dump Stations	Hours of Operation <sup>b</sup>	Maximum Vessel Length	Minimum Depth at Low Tide
Port of Allyn Hood Canal Dock	Allyn	Hood Canal	46°24'"	122°49"	Unknown		Unknown	Unknown	Unknown		
Port of Allyn NorthShore Dock	Belfair	Puget Sound	47°25'09"	122°54'11"	Public Marina	2	Unknown	Unknown	24 hours a day	50	5
Port of Anacortes - Cap Sante Boat Haven	Anacortes	Puget Sound	48°30'39"	122°36'13"	Public Marina	4	4	2	24 hours a day	90	12
Port of Bellingham Cruise Terminal	Bellingham	Puget Sound	48°43'30"	122°31'8"	Public Ferry Terminal	1	0	0	April-October	30	
Port of Bremerton	Port Orchard	Puget Sound	47°33'48"	122°37'21"	Public Marina	2	1	1	8:00 am to 5:00 pm		20
Port of Brownsville	Bremerton	Puget Sound	47°38'58"	122°36'46"	Public Marina	2	2	2	24 hours a day	65	25
Port of Coupeville	Coupeville	Strait of Juan de Fuca	48°13'29"	122°41'34"	Public Marina	1	0	0	24 hours a day		
Port of Edmonds	Edmonds	Puget Sound	47°48'36"	122°23'31"	Full Service Marina	2	Unknown	2	24 hours a day	110	
Port of Everett Marina	Everett	Puget Sound	47°59'51"	122°13'26"	Full Service Marina	5	0	2	24 hours a day		11
Port of Everett Marine Park & Boat Ramp	Everett	Puget Sound	47°59'52"	122°13'26"	Public Marina	5	Unknown	2	24 hours a day	143	
Port of Friday Harbor Marina	Friday Harbor	Puget Sound	48°32'21"	123°00'48"	Public Marina	1	1	2	24 hours a day	64	
Port of Kingston	Kingston	Puget Sound	47°47'38"	122°29'58"	Full Service Marina	1	Unknown	1	Variable	75	15
Port of Olympia - Swantown Marina	Olympia	Puget Sound	47°03'31"	122°53'46"	Public Marina	1	0	1	24 hours a day	100	12
Port of Poulsbo Marina	Poulsbo	Puget Sound	47°43'58"	122°39'52"	Public Marina	1	2	1	8:00 am to 4:30 pm	80	7
Port of Seattle - Bell Harbor Marina	Seattle	Puget Sound	47°36'31"	122°20'48"	Public Marina	2	1	1	24 hours a day	100	22
Port of Shelton - Shelton Yacht Club	Shelton	Puget Sound	47°12'52"	123°05'03"	Public Marina	1	0	1	24 hours a day	50	13
Port of Silverdale	Silverdale	Puget Sound	47°38'30"	122°41'41"	Public Marina	1	Unknown	1	6:00 am to 10:00 pm		10
Port of South Whidbey	Freeland	Puget Sound	48°02'18"	122°24'11"	Public Marina	2	0	1	Unknown	50	6
Port Orchard Marina	Port Orchard	Puget Sound	47°32'42"	122°38'24"	Public Marina	1	1	1	8:00 am to 5:00 pm	100	30
Port Orchard Railway Marina	Reno	Puget Sound	47°32'29"	122°38'43"	Private Marina	1	0	0	24 hours a day	150	0
Port Townsend Boat Haven	Port Townsend	Admiralty Inlet	48°06'26"	122°46'12"	Full Service Marina	2	Unknown	1	24 hours a day		
Port Washington Marina	Bremerton	Puget Sound	47°34'46"	122°38'39"	Marina	1	Unknown	Unknown	24 hours a day		
Quilcene Boat Haven	Quilcene	Hood Canal	47°48'07"	122°51'58"	Public Marina	1	Unknown	Unknown	24 hours a day		6
Roche Harbor Resort	Roche Harbor	Puget Sound	48°36'43"	123°09'25"	Public Marina	2	Unknown	Unknown	24 hours a day		
Sandy Point Marina	Ferndale	Puget Sound	48°47'54"	122°42'22"	Private Marina		Unknown	Unknown	6:30 am to 8:30 pm		
Seacrest Marina	Marysville	Puget Sound	48°1'52"	122°11'17"	Public Marina	1	Unknown	Unknown	Unknown		
Semiahmoo Marina	Blaine	Strait of Georgia	48°59'22"	122°46'02"	Full Service Marina	1	1	0	24 hours a day	75	12
Shilshole Bay Marina	Seattle	Puget Sound	47°40'33"	122°24'46"	Public Marina	4	0	2	24 hours a day		15
Skyline Marina	Anacortes	Puget Sound	48°29'18"	122°40'37"	Private Marina	2	Unknown	1	Variable	100	10
Squalicum Harbor-Port of Bellingham	Bellingham	Strait of Georgia	48°45'13"	122°30'29"	Public Marina	2	8	8	24 hours a day	100	10



Table A-1 (continued). Attributes of Puget Sound Pumpout Facilities (not including mobile services). <sup>a</sup>											
Facility Name	Location	Water Body	Latitude	Longitude	Type of Facility	Number of Stationary Pumpouts	Number of Portable Pumpouts	Number of Dump Stations	Hours of Operation <sup>b</sup>	Maximum Vessel Length	Minimum Depth at Low Tide
Stuart Island State Park/Reid Harbor & Prevost Harbor Marine Parks	Friday Harbor	Puget Sound	48°40'30"	123°12'00"	Public Marina	1	0	1	24 hours a day	60	4
Tacoma Youth Marine Center	Tacoma	Thea Foss Waterway			Unknown		Unknown	Unknown	Unknown		
Totem Moorage	Tacoma	Puget Sound	47°15'27"	122°26'07"	Public Marina	1	Unknown	Unknown	24 hours a day	90	
Twanoh State Park	Union	Hood Canal	47°22'49"	122°58'30"	State Park Marina	1	Unknown	Unknown	24 hours a day		3
Twin Bridges Marina	Mt Vernon	Puget Sound	48°27'"	122°31'"	Private Marina	1	1	1	9:00 am to 5:00 pm	34	11
Tyee Marina	Tacoma	Puget Sound	47°17'42"	122°25'28"	Private Marina	2	0	2	Variable	65	
West Sound Marina	Orcas	Puget Sound	48°37'46"	122°57'36"	Private Marina	1	Unknown	Unknown	Variable		5
Westbay Marina	Olympia	Puget Sound	47°03'56"	122°54'47"	Private Marina	1	Unknown	1	Variable	50	6
Winslow Wharf Marina	Bainbridge Island	Puget Sound	47°37'40"	122°31'20"	Private Marina	Unknown	1	1	9:00 am to 5:00 pm	80	12
Zittel's Marina	Olympia	Puget Sound	47°09'56"	122°48'28"	Full Service Marina	0	2	1	Variable	45	8

<sup>a</sup> This information was largely assimilated from the Washington State Parks (WSP) Pumpout Facility database. The information is continually changing. The WSP database should be accessed for more current information.

